

## Nanoparticles in Sunscreen

### Background to the controversy

Some manufacturers advertise that their sunscreen products do not contain “carcinogenic (cancer-causing) substances” found in other sunscreens. Manufacturers of “holistic” and “all-natural” sunscreens most commonly make this claim.

The substances in question are nanoparticles of titanium dioxide and zinc oxide. Nanoparticles are smaller than 100 nanometres (there are a million nanometres in a millimetre) and are invisible to the naked eye. Nanoparticles of titanium dioxide (TiO<sub>2</sub>) and zinc oxide (ZnO) have been used as active ingredients in sunscreens for three decades because they filter ultraviolet (UV)A as well as UV(B) wave length spectra, providing broader protection than any other sun-screening agent.

### Current evidence

#### Ultraviolet (UV) Radiation

There is definitive evidence that sun exposure contributes to the risk of skin cancer. Solar radiation is classified as a known human carcinogen in the US Report on Carcinogens.<sup>1</sup> The International Agency for Research on Cancer (IARC) also classifies solar radiation as carcinogenic to humans.<sup>2</sup>

#### Nanoparticles in Sunscreen

Nanoparticles are approved for use in sunscreens in Australia by the Therapeutic Goods Administration (TGA). In August 2016, the TGA updated its scientific review on the safety of titanium dioxide and zinc oxide nanoparticles in sunscreens.<sup>3</sup> Most studies included in the review showed that these nanoparticles do not penetrate or minimally penetrate the skin. The TGA’s conclusion was that nanoparticles used as ingredients in sunscreens are unlikely to cause harm when sunscreens are used as directed.

In addition, titanium dioxide and zinc oxide nanoparticles are not considered to be carcinogenic by the US Report on Carcinogens<sup>1</sup> or the IARC.<sup>4</sup>

#### Sunscreen and Skin Cancer Prevention

The use of sunscreen is known to reduce the risk of squamous cell carcinoma, one of the most common skin cancers. In the long term, daily application of sunscreen reduces the risk of skin cancer by almost 40%.<sup>5</sup>

Regular use of sunscreen has also been proven to reduce the incidence of melanoma, the most serious form of skin cancer. An Australian randomised controlled trial published in 2011<sup>6</sup> found that participants who applied sunscreen daily to the head

and arms were significantly less likely to develop melanoma over a ten year follow-up period.

More detailed information about sunscreen can be found on Cancer Council Australia's Sun Protection webpage.<sup>7</sup>

### Summary

Exposure to ultraviolet radiation is a known cause of skin cancer. Regular use of sunscreen has been proven to reduce the risk of common skin cancers, as well as the more serious form, melanoma. There is currently no evidence that nanoparticles used as physical filters in sunscreens (titanium dioxide and zinc oxide) are harmful to health, or increase the risk of any cancers. The TGA conducts regular reviews of the scientific evidence on the safety of these nanoparticles, and Cancer Council WA continues to monitor these developments.

### Further reading

- [Choosing and using sunscreen](#)  
Cancer Council WA
- [Vitamin D – finding the right balance](#)  
Cancer Council WA

### References

1. U.S. Department of Health and Human Services Public Health Service National Toxicology Programme, *14th Report on Carcinogens*, in National Institute of Environmental Sciences. 2016.
2. International Agency for Research on Cancer (IARC). *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans 2007 , IARC: Lyon, France.
3. Therapeutic Goods Administration (TGA), Literature Review on the Safety of Titanium Dioxide and Zinc Oxide Nanoparticles in Sunscreen - Scientific Review Report. 2016, Australian Government - Department of Health and Ageing.
4. International Agency for Research on Cancer (IARC) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 93 - Carbon Black, Titanium Dioxide and Talc*, 2010.
5. van der Pols JC, Williams GM, Pandeya N. et al. Prolonged Prevention of Squamous Cell Carcinoma of the Skin by Regular Sunscreen Use. *Cancer Epidemiology, Biomarkers & Prevention*. 2006; 15(12): 2546-2548.
6. Green AC, Williams GM, Logan V, Strutton GM *Reduced Melanoma After Regular Sunscreen Use: Randomized Trial Follow-Up*, *Journal of Clinical Oncology*, 20 January 2011; 29(3).

7. Cancer Council. *Sun protection* [Version  
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